

Docket No. 99B065-2

IN THE CLAIMS

1. (currently amended) A method of making a ester comprising:

- (a) contacting an olefin selected from the group consisting of ethylene, propylene, isoolefins, normal butenes, and C₅ to C₁₈ olefins ~~or ether~~ with carbon monoxide and an acid composition comprising BF₃·2ROH to form a product composition;
- (b) adding ROH to the product composition of (a); and
- (c) separating an acid product comprising BF₃·2ROH from the ester, wherein ROH is selected from methanol; n-propanol; n-butanol; 2-ethyl hexanol; isohexanol; isooheptanol; isooctanol; isononanol; 3,5,5-trimethyl hexanol; isodecanol; isotridecanol; 1-octanol; 1-decanol; 1-dodecanol; 1-tetradecanol and mixtures thereof.

2. (original) The method of claim 1 further comprising:

- (d) recycling a portion of the separated acid product to contact the olefin or ether.

3. (original) The method of claim 1 wherein the olefin is an isoolefin ~~selected from the group consisting of ethylene, propylene, isoolefins, normal butenes, and C₅ to C₁₈ olefins.~~

4. (original) The method of claim 2 wherein the olefin is isobutene.

5. (cancelled)

6. (cancelled)

Docket No. 99B065-2

7. (currently amended) The method of claim 1 wherein contacting the olefin ~~or other~~ comprises contacting at a temperature from about 60°C to about 200°C.

8. (currently amended) The method of claim 7 wherein contacting the olefin ~~or other~~ comprises contacting at a temperature from about 110°C to about 160°C.

9. (currently amended) The method of claim 1 wherein contacting the olefin ~~or other~~ comprises contacting at a pressure from about 30 atm to about 200 atm.

10. (currently amended) The method of claim 9 wherein contacting the olefin ~~or other~~ comprises contacting at a pressure from about 110 atm to about 160 atm.

11. (original) The method of claim 1 wherein ROH is an alcohol selected from the group consisting of methanol, n-propanol, n-butanol, 2-propanol, 2-ethyl hexanol, isohexanol, isoheptanol, isooctanol, isononanol, 3,5,5-trimethyl hexanol, isodecanol, isotridecanol, 1-octanol, 1-decanol, 1-dodecanol, and 1-tetradecanol.

12. (original) The method of claim 1 wherein ROH is methanol.

13. (cancelled) .

14. (cancelled) .

15. (currently amended) The method of claim 1 further comprising:

Docket No. 99B065-2

(d) contacting the olefin ~~or ether~~ with a hydrocarbon, wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.

16. (original) The method of claim 1 further comprising:

(d) adding a hydrocarbon to the product composition of (a), wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.

17. (original) The method of claim 16 further comprising:

(e) separating the hydrocarbon and ROH from $\text{BF}_3 \cdot 2\text{ROH}$ and directing a portion of the separated hydrocarbon and the separated ROH to a unit selected from the group consisting of a separation unit, a reaction unit, and a combination thereof.

18. (currently amended) The method of claim 1 further comprising:

(d) contacting the olefin ~~or ether~~ with phosphoric acid.

19. (original) The method of claim 1 wherein separating the acid product comprises concentrating the acid product such that the molar ratio $\text{ROH}:\text{BF}_3$ in the concentrated acid product is from about 2:1 to about 4:1.

20. (original) The method of claim 19 wherein the concentrated acid product comprises a molar ratio of $\text{ROH}:\text{BF}_3$ from about 2:1 to about 3:1.

21. (original) The method of claim 1 wherein the acid composition comprises a molar ratio of $\text{ROH}:\text{BF}_3$ from about 1.6:1 to about 3:1.

22. (original) The method of claim 21 wherein the acid composition comprises a molar ratio of $\text{ROH}:\text{BF}_3$ from about 1.9:1 to about 3:1.

23. (original) The method of claim 1 where the product composition contains less than 3% by weight carboxylic acid.

24. (original) A method of making methyl pivalate comprising:
contacting methyl-t-butylether with carbon monoxide and an acid composition comprising $\text{BF}_3 \cdot 2\text{CH}_3\text{OH}$ to form a product composition comprising methyl pivalate;
adding methanol to the product composition; and
separating an acid product comprising $\text{BF}_3 \cdot 2\text{CH}_3\text{OH}$ from the methyl pivalate.

25. (original) The method of claim 24 wherein contacting methyl-t-butylether comprises contacting at a temperature of about 110°C to about 160°C .

26. (original) The method of claim 24 wherein contacting methyl-t-butylether comprises contacting at a pressure from about 30 atm to about 200 atm.

27. (original) The method of claim 24 further comprising contacting the methyl-t-butylether with a hydrocarbon, wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.

28. (original) The method of claim 24 further comprising contacting the product composition with a hydrocarbon, wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.

29. (original) The method of claim 28 further comprising separating the hydrocarbon and the methanol from the methyl pivalate and directing a portion of the separated hydrocarbon and the separated methanol to a unit selected from the group consisting of a separation unit, a reaction unit, and a combination thereof.

Docket No. 99B065-2

30. (original) The method of claim 24 further comprising contacting the methyl-t-butylether with phosphoric acid.

31. (original) The method of claim 24 wherein separating the acid product comprises concentrating the acid product such that the molar ratio ROH:BF₃ in the acid product is from about 2:1 to about 4:1.

32. (original) The method of claim 31 wherein the concentrated acid product comprises a molar ratio of ROH:BF₃ from about 2:1 to about 3:1.

33. (original) The method of claim 24 wherein the acid composition comprises a molar ratio of ROH:BF₃ from about 1.6:1 to about 3: 1.

34. (original) The method of claim 33 wherein the acid composition comprises a molar ratio of ROH:BF₃ from about 1.9:1 to about 3: 1.

35. (original) The method of claim 24 wherein the product composition contains nonanoic methyl esters such that the molar ratio of methyl pivalate to nonanoic methyl esters is about 4 or greater.

36. (currently amended) A method of making a an ester comprising:

- (a) contacting an olefin selected from the group consisting of ethylene, propylene, isoolefins, normal butenes, and C₅ to C₁₈ olefins ~~or ether~~ with carbon monoxide and an acid composition comprising BF₃ ROH to form a product composition;
- (b) adding ROH to the product composition of (a); and
- (c) separating an acid product comprising BF₃·ROH from the ester, wherein ROH is selected from methanol; n-propanol; n-butanol; 2-ethyl hexanol; isohexanol; isoheptanol; isooctanol; isononanol; 3,5,5-trimethyl hexanol; isodecanol; isotridecanol; 1-octanol; 1-decanol; 1-dodecanol; 1-tetradecanol and mixtures thereof

Docket No. 99B065-2

and wherein the molar equivalents of ROH in the $\text{BF}_3 \cdot \text{ROH}$, ranges from about 2 to about 4.

37. (new) A method of making a ester comprising:

- (a) contacting an ether with carbon monoxide and an acid composition comprising $\text{BF}_3 \cdot 2\text{ROH}$ to form a product composition;
- (b) adding ROH to the product composition of (a); and
- (c) separating an acid product comprising $\text{BF}_3 \cdot 2\text{ROH}$ from the ester, wherein ROH is selected from methanol; n-propanol; n-butanol; 2-ethyl hexanol; isohexanol; isoheptanol; isooctanol; isononanol; 3,5,5-trimethyl hexanol; isodecanol; isotridecanol; 1-octanol; 1-decanol; 1-dodecanol; 1-tetradecanol and mixtures thereof.

38. (new) The method of claim 37 further comprising:

- (d) recycling a portion of the separated acid product to contact the olefin or ether.

39. (new) The method of claim 37 wherein the ether is represented by the general formula $\text{R}'\text{-O-R}''$, wherein $\text{R}' = \text{saturated C}_1 - \text{C}_{13}$ alkyl and $\text{R}'' = \text{saturated C}_1 - \text{C}_{13}$ alkyl, and R' and R'' can be the same or different.

40. (new) The method of claim 37 wherein the ether is methyl-t-butylether.

41. (new) The method of claim 37 wherein contacting the olefin or ether comprises contacting at a temperature from about 60°C to about 200°C .

42. (new) The method of claim 37 wherein contacting the ether comprises contacting at a temperature from about 110°C to about 160°C .

Docket No. 99B065-2

43. (new) The method of claim 37 wherein contacting the ether comprises contacting at a pressure from about 30 atm to about 200 atm.

44. (new) The method of claim 37 wherein contacting the ether comprises contacting at a pressure from about 110 atm to about 160 atm.

45. (new) The method of claim 37 wherein ROH is an alcohol selected from the group consisting of methanol, n-propanol, n-butanol, 2-propanol, 2-ethyl hexanol, isohexanol, isoheptanol, isooctanol, isononanol, 3,5,5-trimethyl hexanol, isodecanol, isotridecanol, 1-octanol, 1-decanol, 1-dodecanol, and 1-tetradecanol.

46. (new) The method of claim 37 wherein ROH is methanol.

47. (new) The method of claim 37 wherein the ether is methyl-t-butyl ether.

48. (new) The method of claim 37 wherein the ether is diisopropyl ether and ROH is 2-propanol.

49. (new) The method of claim 37 further comprising:

(d) contacting the olefin or ether with a hydrocarbon, wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.

50. (new) The method of claim 37 further comprising:

(d) adding a hydrocarbon to the product composition of (a), wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.

51. (new) The method of claim 50 further comprising:

Docket No. 99B065-2

(e) separating the hydrocarbon and ROH from $\text{BF}_3 \cdot 2\text{ROH}$ and directing a portion of the separated hydrocarbon and the separated ROH to a unit selected from the group consisting of a separation unit, a reaction unit, and a combination thereof.

52. (new) The method of claim 37 further comprising:

(d) contacting the olefin or ether with phosphoric acid.

53. (new) The method of claim 37 wherein separating the acid product comprises concentrating the acid product such that the molar ratio $\text{ROH}:\text{BF}_3$ in the concentrated acid product is from about 2:1 to about 4:1.

54. (new) The method of claim 53 wherein the concentrated acid product comprises a molar ratio of $\text{ROH}:\text{BF}_3$ from about 2:1 to about 3:1.

55. (new) The method of claim 37 wherein the acid composition comprises a molar ratio of $\text{ROH}:\text{BF}_3$ from about 1.6:1 to about 3:1.

56. (new) The method of claim 55 wherein the acid composition comprises a molar ratio of $\text{ROH}:\text{BF}_3$ from about 1.9:1 to about 3:1.

57. (new) The method of claim 37 where the product composition contains less than 3% by weight carboxylic acid.

58. (new) A method of making an ester comprising:

(a) contacting an ether with carbon monoxide and an acid composition comprising $\text{BF}_3 \cdot \text{ROH}$ to form a product composition;

(b) adding ROH to the product composition of (a); and

Docket No. 99B065-2

(c) separating an acid product comprising $\text{BF}_3 \cdot \text{ROH}$ from the ester, wherein ROH is selected from methanol; n-propanol; n-butanol; 2-ethyl hexanol; isohexanol; isoheptanol; isooctanol; isononanol; 3,5,5-trimethyl hexanol; isodecanol; isotridecanol; 1-octanol; 1-decanol; 1-dodecanol; 1-tetradecanol and mixtures thereof and wherein the molar equivalents of ROH in the $\text{BF}_3 \cdot \text{ROH}$, ranges from about 2 to about 4.